

## REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

|   |                |  |
|---|----------------|--|
| 1. AGENCY USE ONLY (Leave blank)  | 2. REPORT DATE | 3. REPORT TYPE AND DATES COVERED<br>FINAL 01 Jul 94 To 30 Jun 97 |
| 4. TITLE AND SUBTITLE<br>MICROBIAL TOXICITY OF NON-UNIFORM MIXTURES OF XENOBIOTIC CHEMICALS   |                | 5. FUNDING NUMBERS<br>F49620-94-1-0366<br>3484/YS<br>61103D      |
| 6. AUTHOR(S)<br>DR N.N. KHANDAN   |                |  |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)<br>Dept of Civil, Agricultural & Geological Engineering<br>New Mexico State University<br>Box 30001, Dept. 3CE<br>Las Cruces NM 88003-8001 |                | 8. PERFORMING ORGANIZATION<br>REPORT NUMBER                      |
| 9. SPONSORING MONITORING AGENCY NAME(S) AND ADDRESS(ES)<br>AFOSR/NL<br>110 Duncan Ave Room B115<br>Bolling AFB DC 20332-8050<br>Dr Walter Kozumbo   |                | 10. SPONSORING MONITORING<br>AGENCY REPORT NUMBER                |
| 11. SUPPLEMENTARY NOTES   |                |  |

## 12a. DISTRIBUTION AVAILABILITY STATEMENT

Approved for public release;  
distribution unlimited.

## 12b. DISTRIBUTION CODE

## 13. ABSTRACT (Maximum 200 words)

The scope of work under the AASERT grant included measuring and analysis of toxicity data for additional chemicals than the parent grant and to validate models developed under the parent grant. A total of 35 new chemicals were assayed using the procedures developed under the parent grant. Non-uniform, multi-component mixture studies were completed and analyzed using the new modeling approach developed during the previous period. A new statistical modeling approach to analyze nonuniform mixture has been formulated and tested on data generated under the parent grant.

19971003 047

## 14. SUBJECT TERMS

## 15. NUMBER OF PAGES

## 16. PRICE CODE

17. SECURITY CLASSIFICATION  
OF REPORT  
(U)18. SECURITY CLASSIFICATION  
OF THIS PAGE  
(U)19. SECURITY CLASSIFICATION  
OF ABSTRACT  
(U)20. LIMITATION OF ABSTRACT  
(UL)

**FINAL TECHNICAL REPORT**  
**AASERT- GRANT N° F49620-94-0366**  
Final Report

Microbial Toxicity of Nonuniform Mixtures of Xenobiotic Chemicals  
PI: N. Khandan

*Specific progress:*

The scope of work under the AASERT grant included measuring and analysis of toxicity data for additional chemicals than the parent grant and to validate models developed under the parent grant. A total of 35 new chemicals were assayed using the procedures developed under the parent grant. Non-uniform, multi-component mixture studies were completed and analyzed using the new modeling approach developed during the previous period.

A new statistical modeling approach to analyze nonuniform mixture has been formulated and tested on data generated under the parent grant.

*Student performance:*

Two graduate students and an average of four undergraduate students have been supported under this grant. Performance of these students in their academic courses has been very good to excellent: the graduate students both graduated with GPA of 4.0/4.0; The undergraduate students averaged 3.0/4.0, ranging from 2.3 to 3.8 over the period.

*Peer Reviewed Publications:*

Based on the findings from the parent grant and this grant, the following manuscripts have been published in/accepted by peer-reviewed journals:

1. "Joint Toxicity of Organic Chemicals in Mixtures to Activated Sludge Microorganisms"  
Hall, E., Prakash, J., and Khandan, N. N., *Jour. Env. Engrg. ASCE*, p 424, 1996.
2. "Joint Toxicity of Binary Mixtures of Organic Chemicals to Microorganisms"  
Prakash, J., Khandan, N. N., Sun, B., and Peace, J.; *Wat. Res.* ,30, p 1459, 1996.
3. "Estimating Toxicity of Mixtures of Organic Chemicals to A/S Using Surrogate Test Cultures"  
Khandan, N. N., Peace, J., Egemen, E., Mohsin, M., Sun, B., and Hall, E.; *Wat. Sci. & Technol.*, 34, p 87-92 ,1996.
4. "Predicting Microbial Toxicity of Non-uniform Multi-component Mixtures of Organic Chemicals"  
Peace, J., Khandan, N. N. and Egemen, E; *ASCE Jour. Env. Engrg.*, 123, 4, p 329-334, 1997.
5. "Additivity in Microbial Toxicity of Non-uniform Mixtures of Organic Chemicals"  
Khandan, N. N., Xu, S., Trevizo, C., and Brennan, R.;*Ecotox. & Env. Safety*, 37, 1, p 97-102, 1997.

*Peer Reviewed Publications under Review:*

Based on the parent research and the AASERT research, the following manuscripts have been submitted for peer review:

1. "Predicting Microbial Toxicity of Mixtures of Organic Chemicals"  
Khandan, N.; Submitted to *Water Science & Technol.*, May 1997.
2. "Prediction of Microbial Toxicity of Industrial Organic Chemicals"  
Trevizo, C. and Khandan, N.; Submitted to *Water Science & Technol.*, May 1997.

3. "Ranking of Toxic Release Inventory Chemicals Using a Level III Fugacity Model and Toxicity"  
Edwards, F. , Egemen, E. and Khandan, N.; Submitted to *Water Science & Technol.*, May 1997.
4. "Use of QSAR Models in Predicting Joint Effects in Multi-Component Mixtures of Organic Chemicals"  
Xu, S. and Khandan, N.; Submitted to *Water Research*, May 1997.
5. "Structure/Property Activity Relationship Models for Microbial Toxicity of Organic Chemicals"  
Khandan, N., Egemen, E., Trevizo, C., and Xu, S.; Submitted to *Ecotox. & Env. Safety*, Aug. 1997.

Undergraduate students working under the support of this AASERT Project, have made several poster/paper presentations at Regional, National, and International Professional Meetings:

Rachel Brennan, has presented two poster presentations and one paper presentation; another poster has been accepted for presentation at the ACS National Meeting in Aug. 1996.

Rachel Walsh has presented three posters;

Carolina Trevizo has presented two poster presentations, and is preparing a manuscript for peer review; another poster has been accepted for presentation at the ACS National Meeting in Aug. 1996. Her paper won the 2nd place at the Summer 1997 NSF/AMP Research Conference. A paper has been accepted for presentation at the IAWQ Specialized Conference in Cape Town, South Africa.

Wanda Segura has presented two poster presentations.